DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the manufacturing method of the liquid crystal color filter which has a light shielding layer in more detail about the manufacturing method of the liquid crystal color filter used for a liquid crystal color display.
[0002]
[Description of the Prior Art]The liquid crystal color filter used in order to realize the colored presentation of a liquid crystal display, Usually, red (R) patternized for every pixel Green (G) And the transparent coloring layer of three colors of blue (B) and the light shielding layer generally called a black matrix are provided on a transparent substrate.
[0003]In order to be formed in order that said light shielding layer may intercept the light between each transparent coloring layer or between each pixel, and to correspond to high definition-ization of a liquid crystal display in recent years, to have by a detailed pattern and to be formed in very high accuracy is demanded. Then, conventionally, although the photolithograph method was used for production of a light shielding layer, in order to attain low cost-ization of a liquid crystal color filter, a manufacturing process is easy and using print processes excellent in mass production nature is examined in recent years.
[0004]Generally as the above-mentioned print processes, water-less lithography offset printing or intaglio offset printing is used. Among these, in the case where intaglio offset printing is used. For example, drawing 2 (a) The figure (b) after performing the transfer process which transfers the ink 2 for light shielding layers with which the crevice 11 of the intaglio 1 was filled up to the surface of the blanket 3 so that it may be shown So that it may be shown, Presswork to which the surface of the transparent substrate 4 is made to transfer said ink 2 from the blanket 3 is performed, and a light shielding layer is formed.
[0005]The above-mentioned intaglio offset printing is excellent in the linearity of printing lines,

the homogeneity of ink film thickness, etc. compared with said water-less lithography offset printing. Since the depth of the crevice of an intaglio is as deep as about 3-15 micrometers, while being obtained by printing whose thickness of an ink film required for a light shielding layer is 1 time, the thickness of an ink film can be arbitrarily adjusted by adjusting the depth of a crevice. It can be made to transfer thoroughly on the surface of a transparent substrate by using silicone rubber excellent in the mold-release characteristic of ink for the surface rubber layer of a blanket, without making the ink to which it transferred on the surface of the blanket divide, and the light shielding layer whose shape of a line is very sharp can be formed.

[0006]

[Problem(s) to be Solved by the Invention]However, when a surface rubber layer repeats printing with the blanket which consists of silicone rubber, the line width of the ink printed changes gradually and there is a problem that printing quality will deteriorate. If aging of the line width of ink arises when forming a light shielding layer especially, an adverse effect will attain to the numerical aperture of a liquid crystal color filter, and an adverse effect will arise in the imaging quality of a liquid crystal color display by extension.

[0007]Surface tension of silicone rubber is low, and since it is easy to crawl ink, it becomes difficult to receive the ink from a version. For this reason, it will be necessary to suppress the speed (henceforth the transfer rate of ink) of the relative displacement of a blanket and a version to about 1-50 mm/s, and, as a result, the productivity of a liquid crystal color filter will fall in the transfer process to which a blanket is made to transfer ink from a version.

[0008]Then, while printing a light shielding layer as it is also in the outstanding printing quality, it is required that the transfer rate of the ink to a blanket should be made quick, and the productivity of a liquid crystal color filter should be raised. Then, the purpose of this invention is to provide the manufacturing method of the liquid crystal color filter which can be printed as it is also at high productivity about the light shielding layer which was excellent in printing quality.

[0009]

[Means for Solving the Problem]In order that this invention persons may solve an aforementioned problem, as a result of repeating research wholeheartedly, it is a manufacturing method of a liquid crystal color filter which provides a transparent coloring layer and a light shielding layer of a plural color on the surface of a transparent substrate, After filling up a crevice on the surface of an intaglio with ink having contained ferromagnetic metal powder, where a magnetic field is applied from a rear face of a blanket, said ink is transferred to the surface of a blanket from an intaglio, Subsequently, when forming a light shielding layer by transferring said ink to the surface of a transparent substrate from a blanket in the state where said magnetic field is not applied, the new fact that it can print that it is also at high productivity about a light shielding layer which was excellent in printing quality is found out,

and it came to complete this invention.

[0010]Namely, in a transfer process to which ink with which a crevice on the surface of an intaglio was filled up is transferred on the surface of a blanket in this invention, Since ink is compulsorily transferred by magnetism, even if surface tension on the surface of a blanket is low, a transfer rate of ink to a blanket can be made quick. A transfer process to which a manufacturing method of the above-mentioned liquid crystal color filter transfers ink with which a crevice on the surface of an intaglio was filled up on the surface of a blanket, It consists of presswork to which the surface of a transparent substrate is made to transfer said ink from a blanket, Said transfer process is performed by carrying out relative displacement of the blanket along the surface of this intaglio in the state where it was made to contact on the surface of an intaglio, And while said presswork is performed by carrying out relative displacement of said blanket along the surface of this transparent substrate in the state where it was made to contact on the surface of a transparent substrate, Relative displacement of said intaglio and a blanket and relative displacement of said transparent substrate and a blanket, When it is constituted, respectively, using one transportation device so that a whole process from the starting point of movement to a terminal point may become the same about each relative displacement of all, Since an error about a transfer position of ink by which it is generated in said transfer process is offset by error about a transition position of ink by which it is generated in said presswork, a liquid crystal color filter which has the light shielding layer which was excellent in printing accuracy can be obtained.

[0011]

[Embodiment of the Invention]In the manufacturing method of the liquid crystal color filter of this invention, the ink used for production of a light shielding layer, Where a magnetic field is applied from the rear face of a blanket, the surface of a blanket transfers compulsorily from the crevice of an intaglio, and the surface of a transparent substrate transfers from said blanket in the state where said magnetic field subsequently is not applied.

[0012]It is preferred to be switched to the state where the magnetic field is applied as a means to which a magnetic field is applied from the rear face of a blanket in the transfer process which transfers ink to a blanket from an intaglio, and the presswork which transfers ink to a transparent substrate from a blanket, and the state where the magnetic field is not applied. Therefore, only when installing an electromagnet in the inside of the blanket cylinder which twists a blanket and applying a magnetic field, it is preferred to send current through this electromagnet.

[0013]As an electromagnet usable to this invention, especially if the intensity of the magnetic field mentioned later is obtained, it will not be limited, but publicly known various electromagnets can be used conventionally. although the intensity of the magnetic field in the case of a transfer process changes with grades of the content of the ferromagnetic powder

metal in ink, and the shielding effect of the magnetic field by a blanket etc. -- general -- one to 1,000 oersted (Oe) -- it is 100 to 500 oersted preferably. If the intensity of a magnetic field exceeds a mentioned range, since separation with ferromagnetic metal powder and resin advances inside ink, it is not desirable. On the other hand, if intensity is less than said range, the effect of this invention of transferring ink to the surface of a blanket compulsorily will no longer be acquired from the crevice of an intaglio.

[0014]Next, the ink for light shielding layers, intaglio and blanket which are used for this invention, a transparent substrate, etc. are explained in detail. The ink for light shielding layers used for this invention is resin varnish which mixes ink resin, ferromagnetic metal powder, and a solvent, and mixes a black pigment if needed further. If the above-mentioned ink resin has heat resistance, chemical resistance, solvent resistance, a good adhesive property, etc., for example, it is good. For example, it is usable in an epoxy resin, melamine resin, epoxy-melamine resin, polyester melamine resin, an acrylic resin, polyimide resin, etc.

[0015]As the above-mentioned ferromagnetic metal powder, simple substances and these oxides, such as iron, nickel, and cobalt, are used for various ferromagnetic metal and the oxide of those, and a concrete target, for example. The above-mentioned ferromagnetic metal powder is independent, or can mix two or more sorts and can be used. The loadings of ferromagnetic metal powder are usually preferably set up in the range of 20 to 80 weight section ten to 100 weight section to ink resin 100 weight section.

[0016]Ferromagnetic metal powder is set up so that 1 micrometer or less of the mean particle diameter may be preferably set to 0.5 micrometer or less in the ink for light shielding layers. Since there is a possibility that the coarse particle of ferromagnetic metal powder may exist as a projection on the surface of ink after hardening of ink, and the surface smoothness of an ink film may be spoiled when the mean particle diameter in the inside of the ink for light shielding layers of ferromagnetic metal powder exceeds a mentioned range, it is not desirable.

[0017]Only with ferromagnetic metal powder, the above-mentioned black pigment is blended, when the light blocking effect of the ink for light shielding layers is insufficient. As an example of a black pigment, carbon black, titanium black, ferrous sulfate, etc. are raised, for example. The optical density (OD value) of the light blocking effect required of the light shielding layer of a liquid crystal color filter is usually 2.5 (the light transmittance of visible light is about 0.3% or less) or more preferably 2.0 (the light transmittance of visible light is 1.0% or less) or more. In order to set the optical density of a light shielding layer as a mentioned range, 10-200 weight-section combination of the black pigment is usually carried out to ink resin 100 weight section. In this invention, the mixing ratio of ferromagnetic metal powder and a black pigment is set up in consideration of the metastasis of ink and the light blocking effect of ink over a magnetic field. The mixing ratio of this ferromagnetic metal powder and black pigment is usually set up in 10:90-80:20.

[0018]As for the ink for light shielding layers used for this invention, it is preferred that it is hypoviscosity. Specifically, it is suitable that 10-30,000 P of viscosity is 500-10,000 P preferably. In the substrate of the intaglio used for this invention, for example Soda lime glass, non alkaline glass, Resin, such as glass; fluoro-resins, such as silica glass, glass with low alkali content, and low thermal expansion glass, polycarbonate resin, polyether sulfone resin, and polymethacrylic resin; metal, such as stainless steel, copper, and low expansion alloy umber, etc. are used. Especially, it is desirable when using soft glass, such as soda lime glass, reproduces a detailed pattern with high degree of accuracy.

[0019]The crevice of the above-mentioned intaglio is produced according to the pattern of a light shielding layer. 1-15 micrometers, the range of the depth of a crevice is 3-10 micrometers, and it is usually preferably set up according to the thickness of a light shielding layer. Since it will no longer be obtained by printing whose thickness of the ink film needed for a light shielding layer is 1 time if the depth of a crevice is less than said range, it is not desirable. On the other hand, if the depth of a crevice exceeds said range, the light shielding layer formed will become thick too much, and a possibility that the surface smoothness on the light shielding layer itself and the surface of a liquid crystal color filter may fall will arise.

[0020]The above-mentioned pattern is usually formed as lattice-like a pattern or a stripe pattern. Although the width (namely, width of a crevice) of said pattern changes with sizes of a liquid crystal color filter, generally it is preferably set up in 10-50 micrometers 5-80 micrometers. The method of carrying out a squeegee, using a doctor blade as a method of filling up the crevice of the above-mentioned intaglio with ink, the method of using screen-stencil, the method of pouring in with a dispenser (transfer pipet), the method of pouring in with a bubble jet, etc. are raised.

[0021]As a blanket used for this invention, the publicly known thing which made the surface rubber layer which consists of rubbers, such as silicone rubber and an acrylonitrile butadiene rubber (NBR), support can be conventionally used, for example for the surface of base materials, such as a plastic film. A porous sponge layer may be provided between said surface rubber layer and base materials or in the rear face of said base material. The expansion ratio of said sponge layer is set up in consideration of the printing characteristic of a blanket.

[0022]As for the above-mentioned blanket, it is preferred that it is smooth in a surface rubber layer in order to make better surface smoothness of the surface of a light shielding layer. For example, it is suitable that 0.5 micrometer or less of surface roughness of a blanket is especially 0.3 micrometer or less. As a surface rubber layer, when hardness (spring hardness H_S of JIS K6253 $_{-1988}$ printing, JIS A) uses 20-80, and silicone rubber that is especially 40-60, The ink to which transition of ink was good and it transferred from the intaglio can be thoroughly transferred on the surface of a transparent substrate. Since ink is not divided by the blanket and a transparent substrate, it is effective in the edge of a line becoming sharp. this

effect -- printing of a light shielding layer -- the width of a pattern is [like] remarkable in printing of the fine pattern which is 50 micrometers or less.

[0023]As the above-mentioned silicone rubber, millable silicone rubber, RTV silicone rubber, electron beam hardening type silicone rubber, etc. can be used, for example. In order to adjust the hardness of silicone rubber to said range, silicone oil, silicon gel, etc. may be blended suitably. As a base material of a blanket, if the surface is flat, it will be good, for example, metal plates, such as plastic film; aluminum, such as polyethylene, polyethylene terephthalate (PET), polyether sulphone (PES), and polycarbonate (PC), and stainless steel, will be used.

[0024]Although metal, such as copper, aluminum, and stainless steel, is usually used for the blanket cylinder for twisting a blanket, As mentioned above, what is necessary is just to use the blanket cylinder which consists of hard plastic films, such as an acrylic resin besides soda lime glass or silica glass, etc., for example, when the permeability of ultraviolet rays is required of a blanket cylinder.

[0025]What has the transmissivity high as a transparent substrate used for this invention to light with a wavelength of 400-700 nm is preferred, For example, films, such as glass substrates, such as non alkaline glass, soda lime glass, and glass with low alkali content, polyether, polysulfone, polyarylate, are used suitably. The surface of the above-mentioned transparent substrate fully needs to be washed so that it may be easy to receive ink. In order to make ink easy to receive, it is possible to also make the adhesive layer which consists of transparent and heat-resistant high resin on the surface of a transparent substrate form.

[0026]When the adhesive layer is formed on the surface of the transparent substrate, even if the adhesiveness of an ink surface is low, ink can fully be transferred on the surface of a transparent substrate, and what is called piling to which ink remains on the surface of a blanket after presswork does not occur. As existing heat-resistant resin which is used for the above-mentioned adhesive layer, it is transparent, and even if it heat-treats at 220 ** for 1 hour, it is necessary for it to have the transmissivity of not less than 90% to the wavelength of 400-700 nm, and to specifically fulfill the conditions that the percentage reduction of the transmissivity in said wavelength band is 10% or less. As resin which fulfills the above-mentioned conditions, an acrylic resin, polyester resin, melamine resin, an epoxy resin, phenol resin, polyimide resin, or these mixtures are raised, for example. As a coating method of resin, various coating methods with conventionally publicly known dipping, a spin coat, a roll coat, etc. can be used. It is preferably suitable for the thickness of an adhesive layer that it is [1-10-micrometer] 3-8 micrometers. When the thickness of an adhesive layer is less than said range, transfer of ink has a possibility that nonuniformity may arise. On the other hand, since the transmissivity of resin will fall and surface surface smoothness will also fall if the thickness of an adhesive layer exceeds said range, it is not preferred to have an adverse effect on a picture etc.

[0027]Next, drawing 1 (a) and (b) which show the example about the offset press used for

manufacture of the liquid crystal color filter of this invention It explains in detail, referring to it. Drawing 1 (a) and (b) In the shown offset press, the intaglio 1 and the transparent substrate 4 are held at the predetermined intervals on the bench 5, and can move in the rail 54 top laid by the pedestal 51, and can stop it with high degree of accuracy in arbitrary positions. The blanket 3 moves rotating by tabling with the pinion gear 30 attached to the both ends of the blanket cylinder 31, and the rack gear 6 of the couple fixed to the pedestal 51. As for the blanket cylinder 31, the both ends of the axis 34 are held like the conventional thing, enabling free rotation at the tip of the air cylinder 35.

[0028]Printing by the above-mentioned offset press is performed by [as being shown below]. First, after moving the bench 5 and coinciding the reference position 60 located in the middle of the center line 63 of the intaglio 1, and the rotation starting position 61 of the rack gear 6 and the rotation end position 62, The pinion gear 30 and the rack gear 6 are engaged in the rotation starting position 61, and the blanket 3 is contacted on the surface of the intaglio 1 by a predetermined pressure (nip pressure). If the blanket 3 is moved to the rotation end position 62 in this state, it will move the blanket 3 rotating by tabling of said both gears, and the surface of the blanket 3 will transfer to the ink with which the crevice (not shown) of the intaglio 1 was filled up (transfer process).

[0029]Subsequently, after coinciding the center line 64 and the reference position 60 of the transparent substrate 4, the pinion gear 30 and the rack gear 6 are engaged in the rotation starting position 61, and the blanket 3 is contacted on the surface of the transparent substrate 4 by a predetermined pressure (nip pressure). Under the present circumstances, said both gears gear in the same position as the time of a transfer process. If the blanket 3 is moved to the rotation end position 62 in this state, it will move the blanket 3 rotating by the completely same rolling state as a transfer process, and the surface of the transparent substrate 4 will transfer to the ink (not shown) to which the surface of the blanket 3 transferred (presswork).

[0030]In [according to the above-mentioned offset press] both the processes of a transfer process and presswork, Since the pinion gear 30 gears with the rack gear 6 in the same position, the error of the transition position generated in a transfer process can be made to offset by the error of the transition position generated in presswork, and highly precise printing is attained. The error (printing accuracy) of the transition position of the ink printed by this offset press and the position of the crevice of the intaglio corresponding to the ink concerned is a maximum of 5 micrometers, and, specifically, fully fulfills the printing accuracy required of a light filter. Degradation of the printing accuracy by dispersion in the accuracy at the time of manufacturing the rack gear 6 and the pinion gear 30, wear of the gear under continuous printing, etc. does not generate theoretically the offset press shown in drawing 1. Therefore, even if it performs continuous printing of no less than 100,000 sheets, the printing accuracy is fully maintained.

[0031]In the manufacturing method of the liquid crystal color filter of this invention, the ink for light shielding layers printed on the surface of the transparent substrate, It hardens thoroughly by carrying out time (preferably for [Usually 180-250 **] 30 to 180 minutes 200-230 ** for 50 to 80 minutes) stoving to the temperature in which a transparent substrate does not carry out heat modification. Thus, a light shielding layer is formed on the surface of a transparent substrate.

[0032]Formation of a transparent coloring layer may be performed after formation of a light shielding layer, and after forming a transparent coloring layer conversely, a light shielding layer may be formed in the surface of a transparent coloring layer.

[0033]

[Example]Hereafter, this invention is explained based on an example and a comparative example.

Example 1 polyester melamine resin (to what esterified trimellitic acid and neopentyl glycol.) To thing 100 weight section which added methylation melamine resin as a cross linking agent, iron oxide (iron black, BL-100 by Titan Kogyo K.K.) 50 weight section which is ferromagnetic metal powder was added, the solvent (butylcarbitol) adjusted viscosity to 200 P, and the ink for light shielding layers was prepared. The mean particle diameter in the inside of the ink of said iron oxide was 0.1 micrometer.

[0034]Next, the above-mentioned ink for light shielding layers was printed with intaglio offset printing using the offset press shown in drawing 1. That is, the crevice of an intaglio is first filled up with the above-mentioned ink for light shielding layers, and said ink was transferred on the surface of the blanket, applying the magnetic field of about 500 oersteds with the electromagnet built in the blanket cylinder. Subsequently, the ink to which said blanket transferred was transferred on the surface of the transparent substrate in the state where said magnetic field is not applied.

[0035]In printing of the above-mentioned ink for light shielding layers, soda lime glass was used for the substrate of an intaglio. In the range of 400 mm around, the lengthwise direction of the substrate formed in the surface of an intaglio the crevice where a transverse direction consists of a pattern of the shape of a lattice which is a 100-micrometer interval at intervals of 300 micrometers. This crevice was 10 micrometers in depth, and 40 micrometers in width. Silicone rubber of 60 hardness (spring hardness H_S, JIS A) was coated on the base material which consists of a 0.3-mm-thick polyethylene film, and what was made into the total thickness of 1.0 mm was used for the blanket. Soda lime glass was used for the transparent substrate.

[0036]To the transparent substrate by which the ink for light shielding layers was printed, it is red (R) further. Green (G) Blue (B) Print the ink for transparent coloring layers of three colors, and it ranks second, The liquid crystal color filter was produced by carrying out stoving of the transparent substrate for 60 minutes at 230 **, and stiffening thoroughly the ink for light

shielding layers, and the ink for transparent coloring layers.
As opposed to example 2 epoxy-resin (Epicoat 828 by oil recovery shell company) 100 weight section, Iron oxide (iron black, KN-320 by Toda Kogyo Corp.) 100 weight section which is ferromagnetic metal powder was added, the solvent (butylcarbitol) adjusted viscosity to 300 P, and the ink for light shielding layers was prepared. The mean particle diameter in the inside of the ink of said iron oxide was 0.1 micrometer.
[0037]Subsequently, the blanket shown below was used, and also printing of the ink for light shielding layers, printing of the ink for transparent coloring layers, and stoving were performed like Example 1, and the liquid crystal color filter was produced. The blanket used for the above-mentioned printing is the same as what the hardness (H_S, JIS A) of silicone rubber was 50 degrees, and also was used in Example 1.
[0038]As opposed to example 3 acrylic-resin (what added epoxy resin to copolymer of what replaced methyl group of poly-methyl-methacrylate and poly methyl methacrylate by OH radical as cross linking agent) 100 weight section, Nickel (product made from Vacuum metallurgy) 80 weight section and carbon black (Mitsubishi Chemical 100 [MA-]) 50 weight section which are ferromagnetic metal powder were added, the solvent (butylcarbitol) adjusted viscosity to 100 P, and the ink for light shielding layers was prepared. The mean particle diameter in the inside of the ink of said nickel was 0.3 micrometer.
[0039]Subsequently, the blanket shown below was used, and also printing of the ink for light shielding layers, printing of the ink for transparent coloring layers, and stoving were performed like Example 1, and the liquid crystal color filter was produced. The blanket used for the above-mentioned printing is the same as what the hardness (H_S, JIS A) of silicone rubber was 40 degrees, and also was used in Example 1.
[0040]Carbon black (above MA-100) 30 weight section was added to comparative example 1 polyester melamine resin (above) 100 weight section, the solvent (butylcarbitol) adjusted viscosity to 200 P, and the ink for light shielding layers was prepared. Next, the above-mentioned ink for light shielding layers was printed with intaglio offset printing using the usual flat-display-case offset press. That is, after filling up the crevice of the intaglio with the above-mentioned ink for light shielding layers first and transferring this ink on the surface of a blanket, this ink was further transferred on the surface of the transparent substrate.
[0041]The intaglio and blanket which were used for printing of the above-mentioned ink for light shielding layers, and the transparent substrate were the same as what was used in Example 2. Still like Example 1, to the transparent substrate by which the ink for light shielding layers was printed, printing and stoving of the transparent coloring layer were performed, and the liquid crystal color filter was produced to it.
The ink for light shielding layers was printed using the comparative example 2 usual flat-display-case offset press by lithography offset printing using water-less lithography (made by

Toray Industries, Inc.).

[0042]The same pattern as the crevice of the intaglio used in Example 1 was formed in the surface of the above-mentioned water-less lithography. The ink which viscosity was adjusted to 5000 P in order to prevent greasings, such as scumming, and also was prepared like the comparative example 1 was used for the ink for light shielding layers. The blanket and transparent substrate which were used for printing of the above-mentioned ink for light shielding layers were the same as what was used in Example 2.

[0043]Carbon black (above MA-100) 80 weight section was added to comparative example 3 epoxy-resin (above-mentioned Epicoat 828) 100 weight section, the solvent (butylcarbitol) adjusted viscosity to 100 P, and the ink for light shielding layers was produced. Next, the above-mentioned ink for light shielding layers was printed by the screen-stencil using the screen of 400 meshes made from stainless steel. The pattern of a light shielding layer is the same as Example 1.

[0044]Still like Example 1, to the transparent substrate by which the ink for light shielding layers was printed, printing and stoving of the transparent coloring layer were performed, and the liquid crystal color filter was produced to it. About the above-mentioned example and a comparative example, the result of the error (printing accuracy and unit:micrometer) of the transfer rate (mm/s) of the ink from a version to a blanket, and the transition position of ink and the position of the pattern on a version compatible with the ink concerned is shown in Table 1.

[0045]

[Table 1]

	転移速度 (mm／s)	印刷精度 (μm)
実施例1	500	5
実施例2	400	3
実施例3	400	5
比較例1	50	50
比較例2	500	60
比較例3	−	120

[0046]The transfer rate of a blanket when transferring ink on the surface of a blanket the ink for light shielding layers filled up with Examples 1-3 into the crevice of the intaglio, Although all were as quick as 400 - 500 mm/s, ink is not crawled on the surface of a blanket, and ink was able to be transferred thoroughly. The shape of the linearity of printing lines and the edge of printing lines and the surface smoothness of the ink film were good, and the printing hindrance of a pinhole etc. was not produced at all. Therefore, it was able to print that it was also at high productivity about the light shielding layer which was excellent in printing quality.

[0047]In Examples 1-3, since the offset press shown in drawing 1 was used for printing of the

ink for light shielding layers, the light shielding layer which was excellent in printing accuracy was able to be formed. On the other hand, since a magnetic field was not applied to the blanket in the comparative example 1 in the transfer process to which ink is transferred from an intaglio, When the transfer rate of the blanket was made into 50 or more mm/s, the problem that the shape of printing lines was confused, the surface smoothness of an ink film fell, or the printing hindrance of a pinhole etc. occurred arose. The printing accuracy of the light shielding layer was also low.

[0048]Since piling occurred in the comparative example 2 when transferring ink to the surface of a transparent substrate from a blanket although ink has fully been transferred on the surface of the blanket even if the transfer rates of the blanket were 500 mm/s, Compared with the example, the tracking of ink and the shape of edge were inferior. The printing accuracy of the light shielding layer was also low. In the comparative example 3, the printing accuracy of the light shielding layer was very low, and it was not suitable for practical use.

[0049]

[Effect of the Invention]According to the manufacturing method of the liquid crystal color filter of this invention, it can print that it is also at high productivity about the light shielding layer which was excellent in printing quality. Therefore, the manufacturing method of the liquid crystal color filter of this invention is suitably used by making the liquid crystal color filter corresponding to high-definition-izing and low-cost-izing into a manufacturing method.

[Translation done.]